To: Cool, Richard[Cool.Richard@epa.gov]; Cope, Ben[Cope.Ben@epa.gov]; Owens, Kim[Owens.Kim@epa.gov]; Mayers, Timothy[Mayers.Timothy@epa.gov]; Latier, Andrea[Latier.Andrea@epa.gov]
From: Shaw, Hanh
Sent: Tue 10/7/2014 2:08:05 PM
Subject: FW: EPA's comments on Shell's June 19, 2014 ROV-MLC paper
FinalReport_DischargeModeling_MLC_ROV_Burger_J.PDF
Canada ice scour risk protection.pdf

FYI.

From: Greg.Horner@shell.com [mailto:Greg.Horner@shell.com]
Sent: Monday, October 06, 2014 5:12 PM
To: Shaw, Hanh
Cc: Seyfried, Erin; Heather.Ptak@shell.com
Subject: RE: EPA's comments on Shell's June 19, 2014 ROV-MLC paper

Hanh,

Below you will find responses from Shell to EPA's questions 1-6. We are still completing a response to question 7. I trust we can discuss all during our upcoming meeting.

Please note the attached discharge modeling report "*Drill Cuttings Modeling for Mud Line Cellar by Remotely Operated Vehicle (ROV), Burger J Well, Located Offshore Chukchi Sea, Alaska, May 21, 2014*" was prepared for Shell Alaska and is marked Company Confidential.

Regards,

Greg

Response to EPA's MLC ROV Comments

The following is provided to EPA in response to inquiry made by the agency in this area. It is accurate as of the time of submission, but can be subject to change should operating conditions dictate.

1. **Question:** Shell proposes to use a remotely operated vehicle (ROV) as an option to the traditional large-diameter drill bit to construct the mudline cellars (MLC) associated with exploration wells in the Chukchi Sea. EPA requests the following specific information:

a. Shell indicated that the ROV can be deployed and remotely controlled from a marine vessel or drilling unit. Please explain whether the ROV remains tethered to the vessel or drilling unit during the MLC construction period.

Answer: The ROV will remain tethered to the vessel during the entirety of the deployment, excavation, and recovery operations.

a. How has the ROV technology been tested to ensure it can function as designed? Please also explain whether testing has occurred in Arctic conditions.

Answer: Shell is in the process of building a new vehicle for this purpose. The intent is that the vehicle will be thoroughly tested prior to deployment to verify ensure it is operating as intended. This testing will consist of excavating a series of synthetic soils and rocks from a submerged dry-dock facility.

ROV use in this manner itself is not unusual technology, and the method for excavation has been used around the world both on land and subsea for excavations of various sizes and complexities. Similar, but much larger, cutting methods have been used to excavate much larger MLCs off the cost of eastern Canada. A subsea excavator created by a different company has been used for site preparation in the North Sea. Larger subsea excavators have been used the world over for much larger and/or complex excavations. In short, very similar technology has been used for subsea excavations in a range of operational environments inclusive of the Arctic.

Attached is a document that explains the Trenching Suction Hopper Dredge (TSHD) for excavating well cellars off the east coast of Canada. A TSHD operates in similar technical fashion, but on a much larger scale.

Soil Machine Dynamics Ltd. (SMD) are manufacturing our equipment for Fugro. They have a wide variety of experience with subsea excavation of varying scales and all over the world. SMD's website: https://www.smd.co.uk/

Reef Subsea excavators have operated in the North Sea. They also have other excavation equipment that is very similar. Reef Subsea's Website:

http://reefsubsea.com/

The MLC ROV system will include a cutter which is not a novel design. Here are some cutter videos:

http://www.youtube.com/watch?v=QeQE1IBzh2Q

http://www.youtube.com/watch?v=Jrv32cAngkY

http://www.youtube.com/watch?v=oyAHIDyhq0c

2. **Question**: Please provide a complete discussion of any site-specific, geographic, or other constraints that would limit the use of the traditional large-diameter drill bit technology to construct the MLC.

Answer: Some issues related to MLC's by traditional well bit include:

Site Specific: Large cobbles and hard sandstone layers are a few of the geologic features that can make excavation an MLC with the more traditional bit troublesome.

Drilling Unit Based: The use of the MLC bit technology obviously requires a Mobil Offshore Drilling Unit, or MODU. For the MLC to be drilled by bit from the MODU, either a new system must be manufactured or an old system modified, in order to fit the drilling unit to be used – i.e. it is not just "part" of the drilling unit system. If the requirements of the MLC change (new regulations, new equipment requirements, etc.), and that necessitates a different system, then whatever bit system we adopt must also fit into our current drilling units or we will need to secure a new vessel capable of deploying it. This lack of flexibility in this area could be addressed by the use of an MLC ROV technology.

That means that the system will need to be retrofitted into a new vessel to be of any use. As we've learned, this is neither straightforward nor inexpensive. The flip side of that, is that if the requirements of the MLC change (new regulations, new equipment requirements, etc.), and that necessitates a different system, then whatever bit system we adopt must also fit into our current vessels or we will need to secure a new vessel capable of deploying it. The flexibility of the ROV excavator makes this concern go away, and the fleet of vessels we could use to deploy it is significantly wider.

Weather: The nature of the MLC bit system's deployment (number of heavy lifts, precise fittings and difficult connections to make in order to rig up the bit, and the reverse must be done to rig it down) makes this a complicated process. Obviously, this is particularly sensitive to current sea and wind conditions which can hold up deployment, or recovery of the system.

Regulations: Regulatory changes can drive changes to drilling unit equipment. One specific example of this is the requirement for ROV intervention capability on a drilling unit subsea BOP stack. Because the bit can only drill an MLC of a given size, shape, and orientation, it can become difficult to accommodate these requirements without significant rework or addition to the system. An ROV excavation system can excavate the MLC to suit the requirements of the operation, resulting in a much more normal, straightforward, and fit-for-purpose system.

3. **Question:** The primary purpose of the MLC is to protect the blowout preventer against ice scour. Please explain how a cellar that includes a 30-foot wide, 150-foot ramp that leads to the MLC bottom would achieve the intended protection.

Answer: The MLC protects the BOP from ice scour by putting the top of the BOP stack below the depth of the deepest probable ice scour in the area. For an ice keel to strike the top of the BOP stack, it would have to be creating a deeper ice scour than the deepest witnessed in the relevant surveys. The inclusion of the ramp does not in affect this in any way.

4. **Question:** Shell's document includes a drill cuttings model as Attachment A. Shell's consultant used a version (Version 3) of the Offshore Operators Committee (OOC) model that is proprietary and must be purchased. EPA guidance calls for the use of non-proprietary modeling software to support agency decisions when available (EPA Council on Regulatory Environmental Modeling, (CREM) 2009; *http://www.epa.gov/crem/library/cred_guidance_0309.pdf*). When a proprietary model is used, EPA cannot readily verify the underlying model code and cannot share the all aspects of the model during the public process. Therefore, we request that Shell use a model version that is publicly available.

Answer: Section 4.3 of the CREM guidance referenced above states:

To promote the transparency with which decisions are made, EPA prefers using nonproprietary models when available. However, the Agency acknowledges there will be times when the use of proprietary models provides the most reliable and best-accepted characterization of a system

When a proprietary model is used, its use should be accompanied by comprehensive, publicly available documentation. This documentation should describe:

•□□□□□□ The conceptual model and the theoretical basis (as described in Section 3.3.1) for the model.

•□□□□□□ The techniques and procedures used to verify that the proprietary model is free from numerical problems or “bugs” and that it truly represents the conceptual model (as described in Section 3.3.3).

•□□□□□□ The process used to evaluate the model (as described in Section 4.2) and the basis for concluding that the model and its analytical results are of a quality sufficient to serve as the basis for a decision (as described in Section 4.1).

•□□□□□□ To the extent practicable, access to input and output data such that third parties can replicate the model results.

•□□□□□□ Some history on the public availability of the OCC model. It never has been a publically available model, but has been previously provided to EPA and (formerly) MMS.

Version 2.5 was the version that was provided, as an MS-DOS executable, to the OOC member Companies, MMS, and EPA in 1999. It is “public” in the sense that the OOC Member companies are (as per the OOC Exxon contract) free to use it “in any manner they see fit”. That includes giving it away and OOC has provided this version to numerous people who have asked for it, including requests as recently as this year. There were various minor tweaks between 2.5 and 2.6.6 mainly to fix operational problems rather than to improve agreement with validation tests. The operational problems generally revealed themselves when someone was trying to do something new with the model.

Version 2.6.6 was released with Guido to the OOC Member Companies. The OOC members were not licensed to transfer Guido to other parties permanently but they could enable consultants to use the model on their behalf. Fluid Dynamix has not provided the MS-DOS executable for V2.6.6 to any private outside party. Fluid Dynamix believes that OOC’s License for Guido allowed it to provide one copy to MMS and EPA but they are not sure if this was done.

Version 3.0. OOC Version 3 has some significant usability improvements. Its predictions have been checked against a number of important validation studies and the agreement of model predictions with lab and field results is just as good as it was for the previous version.

The OOC Model remains the model for drilling and produced water discharges that has the most extensive published validation studies of any comparable model. Another model EPA used for NPDES permitting work—CORMIX—is also not publically available.

Shell is looking into the potential for a free license to be granted the agency for this model. However, until that time we would be willing to have our modeler work directly with EPA to understand the model we used.

5. **Question:** Please note that Attachment A is incomplete and missing figures from Section 6 and completely missing Sections 7, 8 and 9. The missing figures from Section 6 prevented evaluation of sea bed deposition under the higher current velocity case considered. Sections 7, 8 and 9 refer to the Sensitivity Analysis, Summary and Conclusions, and References, respectively.

Answer: See attached discharge modeling report.

6. **Question:** Page 3 of the Shell document shows a short table at the bottom listing deposition thickness for the 250 micron size component of the discharge at two different current speeds and various distances from the discharge point. Information providing the basis for this table is not included in the appendix and the conclusions made from comparison with Table 3-8 from the Ocean Discharge Criteria Evaluation are unverifiable.

Answer: See attached discharge modeling report.

Warmest regards,

Greg

From: Shaw, Hanh [mailto:Shaw.Hanh@epa.gov]
Sent: Wednesday, September 17, 2014 10:56 AM
To: Horner, Greg J SEPCO-UAA/A/SR
Cc: Opalski, Dan; Soderlund, Dianne; Lidgard, Michael; Seyfried, Erin; Cope, Ben; Owens, Kim; Mayers, Timothy
Subject: EPA's comments on Shell's June 19, 2014 ROV-MLC paper

Greg,

At your request, EPA is providing the following technical comments on Shell's June 19, 2014 paper and associated model describing the remotely operated vehicle option to construct mudline cellars in the Chukchi Sea. We have tentatively set aside October 9, from 12:30-3:30 to meet with Shell to discuss the Notices of Intent requirements under the Chukchi exploration NPDES general permit. Please let me know if you would like to add a conversation about these comments to the meeting agenda.

Thanks,

Hanh

EPA's Comments

1. Shell proposes to use a remotely operated vehicle (ROV) as an option to the traditional large-diameter drill bit to construct the mudline cellars (MLC) associated with exploration wells in the Chukchi Sea. EPA requests the following specific information:

a. Shell indicated that the ROV can be deployed and remotely controlled from a marine vessel or drilling unit. Please explain whether the ROV remains tethered to the vessel or drilling unit during the MLC construction period.

b. How has the ROV technology been tested to ensure it can function as designed? Please also explain whether testing has occurred in Arctic conditions.

2. Please provide a complete discussion of any site-specific, geographic, or other constraints that would limit the use of the traditional large-diameter drill bit technology to construct the MLC.

3. The primary purpose of the MLC is to protect the blowout preventer against ice scour. Please explain how a cellar that includes a 30-foot wide, 150-foot ramp that leads to the MLC bottom would achieve the intended protection.

4. Shell's document includes a drill cuttings model as Attachment A. Shell's consultant used a version (Version 3) of the Offshore Operators Committee (OOC) model that is proprietary and must be purchased. EPA guidance calls for the use of non-proprietary modeling software to support agency decisions when available (EPA Council on Regulatory Environmental Modeling, 2009; *http://www.epa.gov/crem/library/cred_guidance_0309.pdf*). When a proprietary model is used, EPA cannot readily verify the underlying model code and cannot share the all aspects of the model during the public process. Therefore, we request that Shell use a model version that is publicly available.

5. Please note that Attachment A is incomplete and missing figures from Section 6 and completely missing Sections 7, 8 and 9. The missing figures from Section 6 prevented evaluation of sea bed deposition under the higher current velocity case considered. Sections 7, 8 and 9 refer to the Sensitivity Analysis, Summary and Conclusions, and References, respectively.

6. Page 3 of the Shell document shows a short table at the bottom listing deposition thickness for the 250 micron size component of the discharge at two different current speeds and various distances from the discharge point. Information providing the basis for this table is not included in the appendix and the conclusions made from comparison with Table 3-8 from the Ocean Discharge Criteria Evaluation are unverifiable.

7. EPA notes that the discharge from the ROV-MLC technology is quite different from the traditional large-diameter drill bit due to the large volumetric discharge rate of 0.6 cms and high discharge velocity of 4.77 m/s. The impact of high velocity jetting can cause considerable scour on the sea floor and entrain additional materials into suspension. Please provide an evaluation of these types of potential impacts.